



State of New Jersey

Department of Environmental Protection

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NEW JERSEY MARITIME RESOURCES
An Agency of Prosperity New Jersey
and the
New Jersey Commerce and Economic Growth Commission

MEMORANDUM

August 25, 1999

TO: Robert C. Shinn, Jr., Commissioner
NJ Department of Environmental Protection

FROM: Frank M. McDonough, Executive Director *FM*
NJ Maritime Resources

CC: Rick Gimello- Assistant Commissioner, Site Remediation
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SUBJECT: Restoration of the Passaic River

In the past, the restoration of contaminated sediments in the Passaic River was believed to be impractical due to extremely high associated costs (i.e., USACE projected \$4 billion price tag). Based on newly developed decontamination technologies, dredging techniques, beneficial use applications, and a significant decrease in the cost of dredged material management, we believe that the implementation of restoration activities in the Passaic River is now feasible and cost effective.

As outlined in this memorandum, we project a first level cost of approximately \$460 million for the removal of contaminated sediments and habitat restoration in the six navigational reaches of the Passaic River (downstream to the Newark Bay confluence). That projection, if proven, places the project well within our collective means. Moreover, this restoration proposal would result in substantial additional ecological and economic benefits, including:

- A significant reduction in the overall contaminant load in the Passaic River and other areas of the estuary;
- Minimization of ecological and human health risks in the Passaic River and other areas of the estuary;
- An increase of the amount of sediment acceptable for ocean disposal at the HARS;
- A subsequent substantial cost savings to the navigational dredging program;
- Beneficial use of the dredged material for waterfront development and local infrastructure; with
- Subsequent economic benefits to the towns of Harrison, Belleville, Kearny, Newark, Bayonne, and Jersey City.

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the entire six-mile study area of the Passaic River (Figure 1). However, if total funding is not appropriated for the restoration of the entire six-mile study area, "hot spot" removal of highly contaminated sediments may be implemented. A segregated cost of approximately \$252 million is predicted for highly contaminated "hot spot" removal from the Harrison Reach (adjacent to the former Diamond Alkali facility). While under this scenario some economic benefits to the Passaic River region would be realized, much of the benefit to the dredging program in the Newark Bay complex would likely be lost.

This memorandum summarizes data on chemical concentrations in the Passaic River, restoration options, decontamination technologies, projected costs, funding sources, challenges, and future steps for the implementation of restoration activities on the Passaic River.

1.0 BACKGROUND

Field investigations conducted since 1985 have reported the presence of toxic substances including dioxins (particularly 2,3,7,8-tetrachlorodibenzo-p-dioxin [TCDD]), polychlorinated dibenzofurans (PCDF), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), DDT, and trace metals in sediments of the Passaic River. Many of these Chemicals of Concern (COCs) pose a risk to ecological resources and humans in the Passaic River and the NY/NJ Estuary. Contaminated sediments in the Passaic River have been transported and continue to migrate to Newark Bay and other areas of the estuary. These COCs (specifically TCDD, DDT), originating from the Passaic River, impact the ecological health and economic viability of the Port of NY/NJ.

Sediment containing TCDD is especially problematic for federal navigational and private berthing dredging disposal/placement options. Based on bioaccumulation data, dredged material in the harbor containing TCDD in excess of approximately 30 parts per trillion (ppt) in the sediment typically fails classification for ocean placement at the Historic Area Remediation Site (HARS). The management of material unacceptable for HARS is much more costly (\$29/cubic yard [cyd]) when compared to unrestricted ocean placement (\$3-8/cyd). Therefore, the reduction in contaminant loadings in sediments to "clean" levels will result in more dredging projects suitable for ocean placement at significant savings. The realized cost/environmental benefit of implementing the current Contaminant Assessment Reduction Program (CARP), as stated in the Dredged Material Management Plan (DMMP) (September 1999), is over \$850,000,000 over the 40 year planning period. Further reduction of contaminant loadings in the harbor, as a result of dioxin hot spot dredging would increase and accelerate this tremendous cost saving. Specifically, navigational channels including Newark Bay, the Arthur Kill, Kill van Kull, Hackensack River, and Raritan River would be positively affected over time. The Harbor Modeling Program, part of the Harbor Estuary Program (HEP), will evaluate the predicted contaminant loading over time within these areas of the Estuary.

Historical (1984-1994) and recent investigations (1995) identified TCDD concentrations within all navigational reaches and shallow mudflats of the Passaic River. The ranges of surficial and maximum concentrations at depth within each reach are presented in Table 1. The highest concentration (60 parts per million (ppm) at 5 ft)) was found in sediments within the Harrison Reach directly adjacent to the former Diamond Alkali Facility, located on 80 Lister Avenue (Site). Historical dioxin releases (1950s and 1960s) from this facility based on radiogeochemistry dating as well as elevated TCDD

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and metal concentrations within the waterway adjacent to the Site, shows that the Site is an apparent source of TCDD in sediments of the Passaic River, Newark Bay and possibly in several other areas of NY/NJ harbor. Subsequently, the six-mile stretch of the Passaic River (i.e., 3-miles upstream and downstream of the Site; Figure 1) is in the process of a remedial investigation/feasibility study (RI/FS) pursuant to the Superfund Program. This six-mile stretch is designated by Superfund as a "riverine study area" or Operable Unit 2. A distinct "hot spot" is evident adjacent to and downstream of the Site where historic discharge spills and depositional processes have contributed to the elevated TCDD concentrations. (Figure 2).

Table 1
2,3,7,8 -TCDD Concentrations in Sediments of the Passaic River (6-mile Study Area)

NAVIGATIONAL REACH	2,3,7,8-TCDD CONCENTRATION (0-2 INCHES: PPT)		2,3,7,8-TCDD		DREDGING DEPTH (RATIONALE)
	Min	Max	Maximum Concentration (ppt)	Depth (ft)	
Point No Point (Downstream confluence)	85	1,000	11,900	4	16 ft • 14 ft: 516 ppt TCDD • 15 ft: ND
Harrison Reach (East) - Site	202	13,500	60,000,000	5	19 ft • 15.8 ft: 151 ppt TCDD • 17 ft: 7.8 ppm Mercury
Harrison Reach (West) - Site	11	9,700	596,000	13.2	19 ft • 16 ft: 28 ppb TCDD • 17 ft: 51 ppt TCDD
Newark	3.5	5,500	32,000	10	15 ft (Conservative) • No data collected below 10 ft (with 32 ppb TCDD)
Kearny	80	6,600	26,000	2	10 ft (Conservative) • 5 ft: 2 ppb TCDD (1984-89 data) • 7 ft: 5 ppt TCDD (1995 data) • No data collected below 7 ft
Arlington (Upstream)	21	630	32,000	2	10 ft (Conservative) • Hot spot of TCDD at 2 ft • 4 ft: 31 ppt

2.0 RESTORATION ACTIONS

The removal of contaminated sediments within the Passaic River would result in the significant reduction of chemical exposure to humans and ecological receptors in the Passaic and potentially in many other areas of the NY/NJ Estuary. By initiating an environmental dredging program in the

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many other areas of the NY/NJ Estuary. By initiating an environmental dredging program in the Passaic River, a significant contaminant mass indicative of a historically industrialized waterway would be removed. Contaminants found in sediments targeted for removal would no longer be transported to Newark Bay. This would reduce the overall dioxin inputs to the system and potentially increase significantly the amount of HARS suitable navigational dredged material throughout the Harbor.

Realistically, point and non-point sources will continue to input contaminants to the waterway. However, bi-state and federal pollution prevention programs already underway in the short to long term will reduce these contributions significantly to the Passaic River. The proposed remedial action, in conjunction with these programs, will reduce the total mass load to the Passaic River possibly rendering these sediments "acceptable" for placement at the HARS or beneficial use when subsequent dredging is required.

Furthermore, there are substantial economic benefits to the area surrounding the Passaic River. The City of Newark is undergoing a "renaissance". With the newly constructed NJ Performing Arts Center, the return after 40 years of the Newark Bears Independent League ball club, the Joseph G. Minish Historical Waterfront development and a surge of brownfield restoration projects, the restoration of the Passaic River is the "anchor" and could be the economic driver for further development in this corridor. Harrison, Belleville, Kearny, Newark, Bayonne, Jersey City would benefit by this restoration.

For the purpose of this scoping document, two restoration option scenarios are presented in the following sections.

2.1 Restoration Option 1

Restoration Option 1 includes the removal of sediment within the entire six-mile study area of the Passaic River. The total volumes to be removed from each Federal Navigation Reach are based on the chemical concentrations measured in the sediments collected from historical investigations during 1984 to 1995 (Table 1). These data included surficial through depth (sediment cores) chemical concentrations. Table 2 presents the dredging footprint and total volume of sediment to be removed from each reach.

In Restoration Option 1, a total of 10,074,247 cubic yards of sediment would be dredged from all reaches in the river. The remedial area is defined as the area that contains sediment at concentrations of dioxin greater than approximately 30 ppt. This concentration is the estimated bulk sediment concentration that typically results in 1 part per trillion (ppt) or greater bioaccumulation in the sandworm. It is assumed that the removal of the dioxin would also include many other COCs contributing to contaminant loading and risk. However, an increased dredging depth of 19-ft in the Harrison Reach is suggested due to the high levels of mercury found at 17-ft depth. Two feet of overdredge was added to the dredging depth to ensure complete removal of contaminated materials. Figure 3 presents a conceptual diagram of the contaminated sediment within the six-mile stretch that would be removed. The volume of dredged material for removal is substantially overestimated due to the assumption that depth of contamination is consistent within each reach.

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The sediment would be incrementally excavated starting in the upstream reaches of the river. A sediment migration control system, such as a silt curtain, would be installed downstream of the river. In addition, current best management practices would be implemented to minimize the resuspension of sediments during dredging activities. Dredging under low flow conditions would be most preferable. The sediment would be dewatered (if necessary) and decontaminated using several existing technologies that have commercial scale applications.

Technology Options

Based on previous experience, thermal destruction technologies work best for the decontamination of sediments containing high levels of dioxin and organic chemicals. Moderate to less contaminated sediments, found in the Arlington, Kearny, and Point No Point Reaches, might also be decontaminated using a non-thermal sediment washing technology (Figure 3). Decontamination would generate high value beneficial use end products such as manufactured cement, lightweight aggregate [LWA], manufactured soil, or architectural tiles. These beneficial use products could be used for local riverfront and downtown Newark (adjacent communities) re-development, enhancement and restoration projects. Waterfront Development Programs in the Newark area, such as Minish Park, could utilize decontaminated amended dredged material. Material could also be used for landfill closure and brownfield restoration, habitat creation/restoration or in transportation projects such as the NJ Transit light rail expansion in Jersey City.

Table 2
Dredging Footprint for the Passaic River

<i>REACH (PRIORITIZED¹)</i>	<i>LENGTH (FT)</i>	<i>WIDTH (FT)</i>	<i>DEPTH (FT)²</i>	<i>TOTAL VOLUME (CYD)</i>
Harrison Reach (East) - Site	4,500	675	19	2,137,500
Harrison Reach (West) - Site	6,600	525	19	2,438,333
Point No Point	6,563	750	15	2,734,583
Newark	7,775	437.5	15	1,889,757
Kearny	5,200	400	10	770,700
Arlington	700	400	10	103,704
Total	31,338 ft (5.94 miles)			10,074,247

¹ Reaches are prioritized in the order of importance for remediation. The order reflects the most contaminated to the least contaminated reach.

² Dredging depth is determined based on contaminant concentrations presented in Table 1.

³ Dredging volume is an overestimation assuming depth to contamination is consistent across reach.

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2.2 Restoration Option 2

The second restoration option is the prioritization of the reaches for remedial actions. The most contaminated sediments, such as those found in the Harrison Reach, would have first priority status and be removed first. If appropriations are available, the other reaches would be remediated in the order specified in Table 2 (in the order of descending contamination levels). The removal of the most contaminated sediments (maximum of dioxin 60 ppm) would result in a minimization of overall risk and contaminant loading within the harbor. The sediments would be decontaminated and used in a similar manner to that discussed in Restoration Option 1. Option 2, however, would be unlikely to result in an immediate economic benefit to the Port and Port community. If contaminated sediments from the remaining navigational reaches are not removed from the Passaic River, sediments containing dioxin (and other COCs) would continue to be transported to Newark Bay and impact the Navigational Dredging Program.

2.3 Environmental Monitoring

Environmental monitoring must take place during and following the implementation of the dredging activities. Surface water samples must be collected and analyzed for total suspended solids (TSS), turbidity and/or TCDD downstream of the silt curtain. These samples will verify the adequacy of the siltation control system used during dredging activities. After the removal of contaminated sediment, sediment samples would be collected for chemical and toxicological analyses. Exposed sediment would be tested to determine the adequacy of the dredging depth. The remaining sediments should contain sufficiently low chemical concentrations. Therefore, any sediments that were transported to Newark Bay and other areas of the estuary would meet classification criteria for ocean disposal at the HARS.

3.0 ASSOCIATED COSTS

The costs associated with dredging the reaches of the Passaic River are presented below in Table 3.

Table 3: Restoration Option Costs

REACH (PRIORITIZED)	VOLUME (CYD)	ACTIVITY	TECHNOLOGY	\$COST/CYD ¹	\$ TOTAL COST
Harrison Reach (East)	2,137,500	Dredging	NA	5/cyd	10,687,500
		Decontamination	Thermal Destruction	50/cyd	106,875,000
Harrison Reach (West)	2,438,333	Dredging	NA	5/cyd	12,191,665
		Decontamination	Thermal Destruction	50/cyd	121,916,650
Point No Point	2,734,583	Dredging	NA	5/cyd	13,672,915
		Decontamination	Sediment Washing	29/cyd	79,302,907
Newark	1,889,757	Dredging	NA	5/cyd	9,448,785
		Decontamination	Thermal Destruction	40/cyd	75,590,280

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REACH (PRIORITIZED)	VOLUME (CYD)	ACTIVITY	TECHNOLOGY	\$COST/CYD ¹	\$ TOTAL COST
Kearny	770,700	Dredging	NA	5/cyd	3,851,850
		Decontamination	Sediment Washing	29/cyd	22,340,730
Arlington	103,704	Dredging	NA	5/cyd	518,520
		Decontamination	Sediment Washing	29/cyd	3,007,416
Total					459,404,218

¹ Costs for decontamination of sediment containing moderate to low levels of contamination are based on the federal standard of \$29/cyd. Decontamination of sediment containing higher levels of dioxin (e.g., 1 ppb TCDD) was assumed to cost between \$40 and \$50/cyd due to special materials handling protocols.

4.0 CHALLENGES

The following challenges need to be considered and resolved prior to remedial option selection:

- *Resuspension and mobilization of contaminated sediments during dredging:* Past remedial dredging projects have shown that resuspension appears to be very localized, to within a few feet of the original disturbance. However, sediment resuspension can be minimized using silt curtains, environmental closed bucket clamshell dredge, innovative dredging techniques (cable-arm dredge), control the speed and depth of cut, dredge under low flow conditions, tidal fluctuations, no barge overflow, etc.
- *Removal of highly dioxin-contaminated (approximately 60 ppm) sediment at depth:* Special handling procedures and health and safety precautions must be implemented during the dredging and processing of contaminated material (especially in Harrison Reach).
- *Recontamination of sediments in the target areas from Combined Sewer Overflows (CSOs) and other sources in the Passaic River:* The Contaminant Reduction Programs, including the Contaminant Assessment Reduction Program (CARP), CSO investigations, toxic track down, Harbor Estuary Program (HEP), and other state, federal, and municipal programs will minimize the future contaminant loading in the Passaic River. However, it is unlikely that recontamination would result in non-HARS suitable material.
- *Air emissions (specifically mercury) and residual management of waste streams during decontamination of highly contaminated sediments:* Environmental monitoring requirements, as specified in NJDEP permits, would be required to minimize the release of any waste streams resulting from the decontamination technology(s).
- *Destruction of benthic fauna in the entire Passaic River:* Dredging technologies will result in the destruction of the already degraded benthic macroinvertebrate population. However, ecological investigations report low species richness and abundance in the population currently

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inhabiting the Passaic River. Following the remedial actions, the benthic community should recover rapidly and would likely be characterized by a highly abundant and diverse population.

- *Minimization of impacts on fish population:* Fish may be captured within the Passaic River and released outside the dredging area. Since the dredging area will be localized, movement of the fish community would occur.
- *Dioxin land-source control at Lister Ave Site:* Remediation or source control of contaminated soils (containing high levels of dioxin at depth) and groundwater must be implemented to reduce possible recontamination of Passaic River sediments. Bulkheading and slurry walls are anticipated to be constructed adjacent to the riverine portion of the Site (pursuant to the Superfund program).
- *Funding:* A funding package must be developed for the remediation of Passaic River sediments. Stakeholders could include local (Newark), state (NJDEP, NJMR) and federal governments (EPA, USACE, DOE, NOAA, HUD), as well as Potential Responsible Parties (PRPs: CLH, Sherman Williams, Benjamin Moore, etc.). Because WRDA currently authorizes environmental dredging in the Passaic River, congressional appropriations will also be necessary. A description of the stakeholders are presented in Section 6.0.

5.0 FUTURE STEPS

Contaminated sediment within all six federal navigation reaches of the six-mile study area of the Passaic River should be removed if there is sufficient regional interest and funding is made available. A first level cost analysis of \$459,404,218 is projected for removal of all contaminated sediments within the 6 reaches. A segregated cost of \$251,670,815 is predicted for highly contaminated "hot spot" removal from Harrison Reach (Site). Future steps that are necessary to implement these remedial options include:

- Collection of additional chemical sediment data for a more accurate estimate of sediment removal in Arlington and Kearny Reaches. Sediment samples should be collected at depth to better delineate the contaminant concentrations to confirm the actual volume of sediment to be removed;
- Verification of chemical concentrations at depth to confirm dredging depths specified in Table 2;
- Economic cost/benefit analysis;
- Evaluation of the contaminant migration modeling efforts and coordination with present RI/FS modeling approaches;
- Evaluation of the overall cost reduction in the navigational dredging program, as a result of an increased volume of sediment to be placed at the HARS;
- Evaluation of crossings (e.g., electrical or gas lines, air draft clearance, bridge footings);
- Preparation of a Remedial Action Workplan;
- Reconnaissance of interested parties and congressional interests;

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- Development of a funding package;
- Development of a public outreach strategy; and
- Development of briefing materials and packages.

6.0 APPROPRIATIONS PACKAGE

A consortium of groups, organizations and political strongholds that have a stake in the environmental restoration and redevelopment of the Passaic River corridor should be formed. A comprehensive funding package would then be constructed with each stakeholder having a vested interest in the success of this project. The following are potential stakeholders to be contacted and relationships developed.

Local Government

Nearby towns would substantially benefit from the restoration of the Passaic River. Economic benefits and revitalization of the waterfront communities would result from economic drivers associated with infrastructure development, creation of jobs, local waterfront access, housing improvements, public education, new businesses (including waterborne commerce such as ferries, cruise boats, etc) and aesthetic alterations. Communities in the Passaic River watershed that would benefit from this restoration program are:

- Newark
- Harrison
- Belleville
- Kearny
- Bayonne
- Jersey City

State Agencies

- NJMR : The success of this project would result in a substantial reduction of costs associated with dredged material management in the NY/NJ Harbor Estuary. Reduction of contaminants in this watershed should result in less of a contaminant load to the rest of the Harbor. NJMR is also the program lead on the NJ Sediment Decontamination Program.
- NJDEP: The restoration of the Passaic River sediments would:
 - 1) result in the reduction in contaminant loading in the Passaic River, Newark Bay, and the NY/NJ Estuary;

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- 2) restore biological resources in the Passaic River;
 - 3) result in a decrease in ecological and human health risks in the Passaic River and downstream areas of the Harbor;
 - 4) increase watershed protection efforts to prevent recontamination of the river and estuary; and
 - 5) finalize over a decade of studies to arrive at a solution.
- Port Authority of NY/NJ: Contaminant reduction within Newark Bay and other areas of the Harbor would result in decreased costs for navigational dredging programs and management of dredged material. Reduction of contaminant loads in the Passaic River would directly affect the suitability of dredged material for ocean placement in the vicinity of the Port Newark Marine Terminal.
 - Economic Development Authority: EDA provides grants for businesses, municipalities, or persons who voluntarily undertake remediation of hazardous sites. Grants may be awarded up to \$2 million per year for investigations, remedial activities, or use of innovative technologies. An NJDEP approved proposal could be forwarded to EDA for further funding considerations.
 - Department of Community Affairs, Housing Mortgage Finance Agency: NJHMFA provides funds for home mortgages, promotes construction and rehabilitation for rental housing, advances the growth and development of municipalities, and contributes to the quality of life of older adults, the disabled, and those with special housing needs. The NJHMFA may be interested in this restoration project due to the positive benefits on waterfront redevelopment and housing improvements.

Federal Government

- USEPA: EPA's interest is similar to that specified for the NJDEP. However, these efforts could be accomplished in a more rapid, focused "action oriented" manner outside of the Superfund process. EPA Region 2 serves a lead role in project direction/oversight for the Water Resources Development Act (WRDA) NY/NJ Harbor Sediment Decontamination Program. EPA is the lead agency for the Federal Brownfield Program.
- USACE: WRDA 1999 authorized environmental dredging by the USACE in the Passaic River. Since the Passaic River is a Federal navigational channel with an authorized depth of 30 feet in the Point No Point Reach and 20 feet in the upstream navigational reaches, the USACE may conduct both navigational and environmental dredging to those depths at a cost of \$29/cyd. Any differential costs for remediation of highly contaminated material would need to be addressed. The USACE also shares joint authority with EPA on the WRDA Sediment Decontamination Program.
- Department of Energy: DOE objectives include the development of innovative remedial technology applications and technical transfer as a result of soil and sediment clean-up at DOE sites. Brookhaven National Laboratory is cooperating with EPA and the USACE on the WRDA Sediment Program. DOE also promoted development of public-private partnerships to entice program development in the private sector.

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- **NOAA:** As a federal trustee, NOAA has a vested interest in the ecological restoration of the Passaic River.
- **Housing and Urban Development:** HUD may be interested in this project due to the positive impact on associated brownfield redevelopment and new housing.

Regional Universities/Public Outreach

Several regional universities have research programs that have used the Passaic River as a field laboratory. These are in the areas of innovative sediment decontamination, phytoremediation, hazardous waste identification, analytical testing and biological diversity that includes bioaccumulation of benthic species and wildlife in the Passaic River watershed. Rutgers University has an ongoing sediment decontamination Public Outreach Program as part of the WRDA decontamination efforts. WRDA 1999 also authorizes the USACE to enter into cooperative agreements with academic institutions. Community focus can be generated through public education efforts similar to the Newark Museum.

- Rutgers University
- Stevens Institute of Technology
- New Jersey Institute of Technology (Northeast Hazardous Waste Research Center)
- New Jersey School of Medicine and Dentistry - Department of Occupational Medicine
- New Jersey Marine Sciences Consortium

Foundations

Foundations consider physical improvements to neighborhoods, brownfields projects, and city revitalization efforts as charitable works.

- **Prudential Foundation:** This foundation has annual budget of \$20 million and has donated approximately \$300 million since it was established. The foundation has recently donated \$6.5 million to the New Jersey Center for the Performing Arts in an effort to revitalize the area. The restoration of the Passaic River would further support their efforts.
- **Working Waterfront Association:** The WFA has played a very high profile role in harbor restoration efforts and has access to a number of charitable funds, including the Rockefeller Fund.
- **Other**

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Potential Responsible Parties (PRPs)

- Chemical Land Holdings (former Diamond Alkali Facility): Partial funding of the restoration of the Passaic River would alleviate further long-term investigations pursuant to the Superfund Program.
- Sherman Williams: This facility was a potential source of mercury contamination within the Passaic River. The maximum dredging depth was increased due to the mercury concentrations found at depth within the Harrison Reach.
- Benjamin Moore: This facility was a potential source of mercury contamination within the Passaic River. The maximum dredging depth was increased due to the mercury concentrations found at depth within the Harrison Reach.
- Reilly Tar Site
- Montrose Chemical Company
- Others identified by EPA/DEP

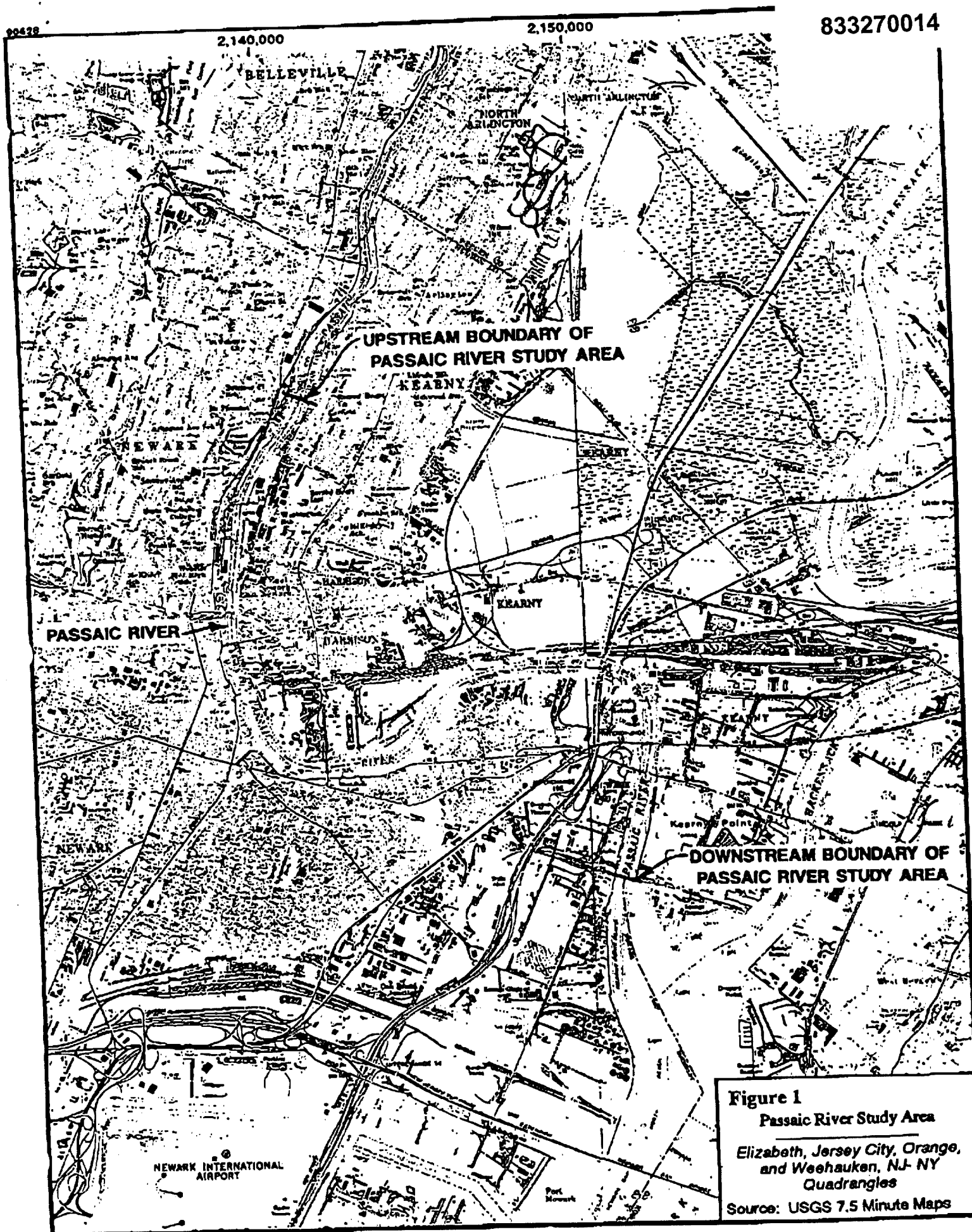
Private Loan Sources

- Fleet Bank
- Summit Bank
- Other

Complementary Funding

The Corporate Business Tax is currently used to fund Watershed Management Programs. In the Passaic and NY/NJ Harbor Region, watershed management efforts are underway to protect surface water quality, which in turn prevents sediment contamination. These Watershed efforts complement the Passaic restoration project by preventing recontamination of sediment once the restoration project is completed. The NJDEP dedicates \$5 million annually to watershed management in the State. A portion of that amount (approximately \$300,000) is provided to each of the Watershed Management Areas 3, 4, 5, and 7, which border the Passaic River and the NY/NJ Harbor.

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DRAFT map produced by Brookhaven National Laboratory for
United States Environmental Protection Agency Region II
Map depicts interpolated surficial sediment concentration of
2,3,7,8-TCDD in Newark Bay and vicinity
Data source: NOAA 1985



Surficial 2,3,7,8-TCDD Sediment Concentrations Newark Bay and Vicinity

Figure 2: Aerial Distribution of 2,3,7,8-TCDD in the Passaic River and Newark Bay

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